Emission Trading Overview

RCSP Annual Review
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Disclaimer

As a result of circumstances, many of these slides were developed by Industrial Economics. Additional Slides covering background information and credit based issues were developed by the presenter and represent the views of AJW, not necessarily of Industrial Economics.

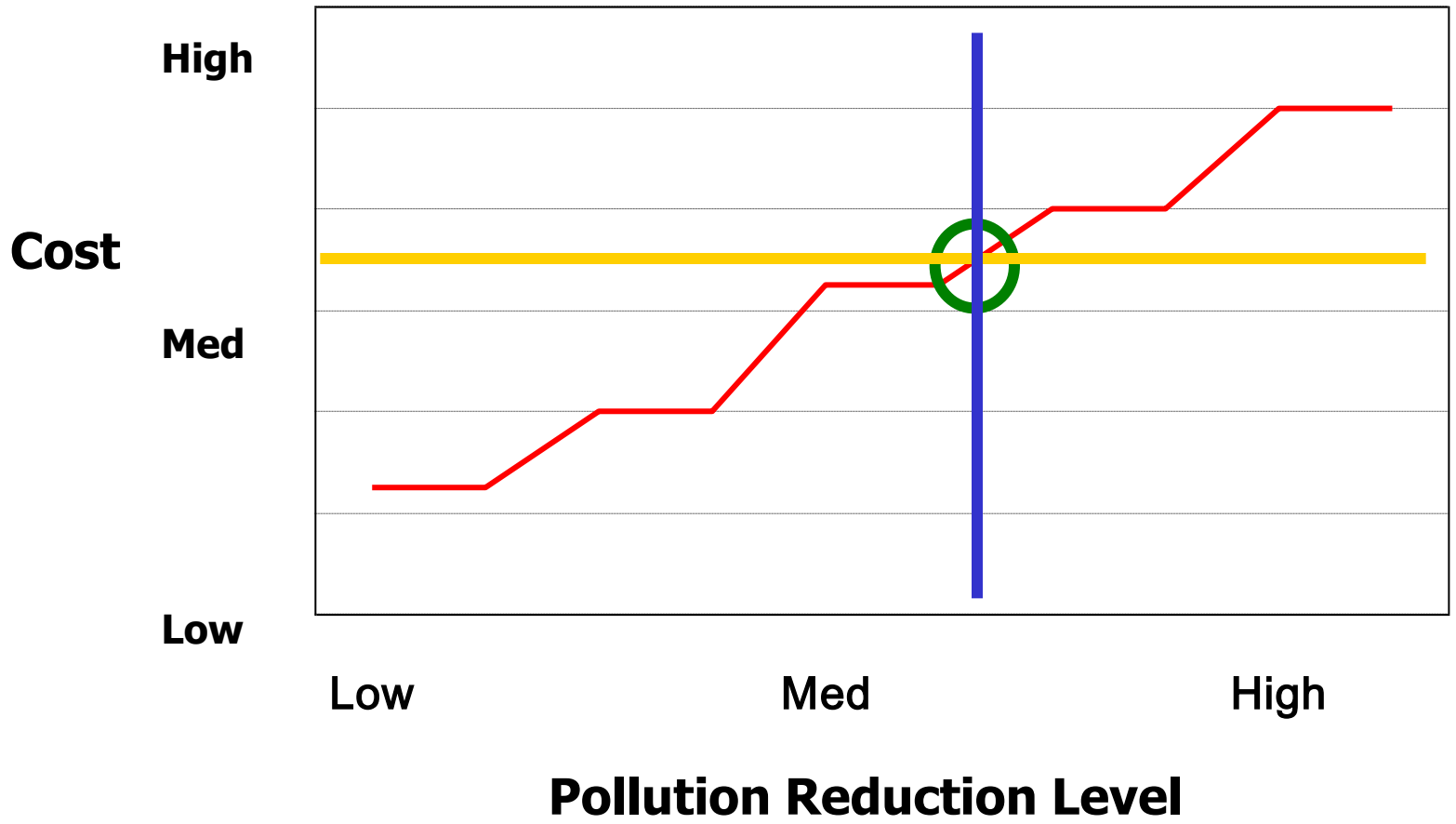
Outline

1. **Emission Trading Overview**
   - **What We Are Really Talking About**
   - **Overview Of Economic Incentives**
   - **Experience**
2. **Application to GHG Trading**
3. **Implications for CCS – RCSP Projects**

What Are We Really Talking About?

Different Means to the Same End…

Taxes Emission Trading Command-and-Control (CAC)

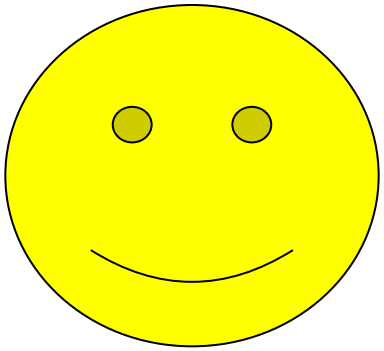


The Evolution of "Cap and Trade"

CAC → RACT / BACT / LAER → Exemptions / Waivers

~~Bubbles~~
~~Offsets~~
~~Emission Reduction Credits (ERCs)~~

Allowances
(Cap and Trade)
(Acid Rain)



What is a Cap-and-Trade Program?

- Market-based policy tool.
- Sets a maximum allowable emission level, that is, a ‘cap’ on emissions.
- Offers flexibility – Allows emission sources to choose their compliance strategy.
- Five Basic Design Principles

Cap-and-Trade. Design Principles

1. A "Cap" represents the maximum amount of emissions for a group of sources, for a fixed compliance period (e.g., 1 year).
   - Typically, the Cap:
     - Is set at a level lower than current emissions;
     - Declines over time; and
     - Offers certainty that a specific emission reduction target will be met.
   - But, caps also tend to be set as part of a political process – Consensus on what constitutes an appropriate cap can be difficult to achieve.

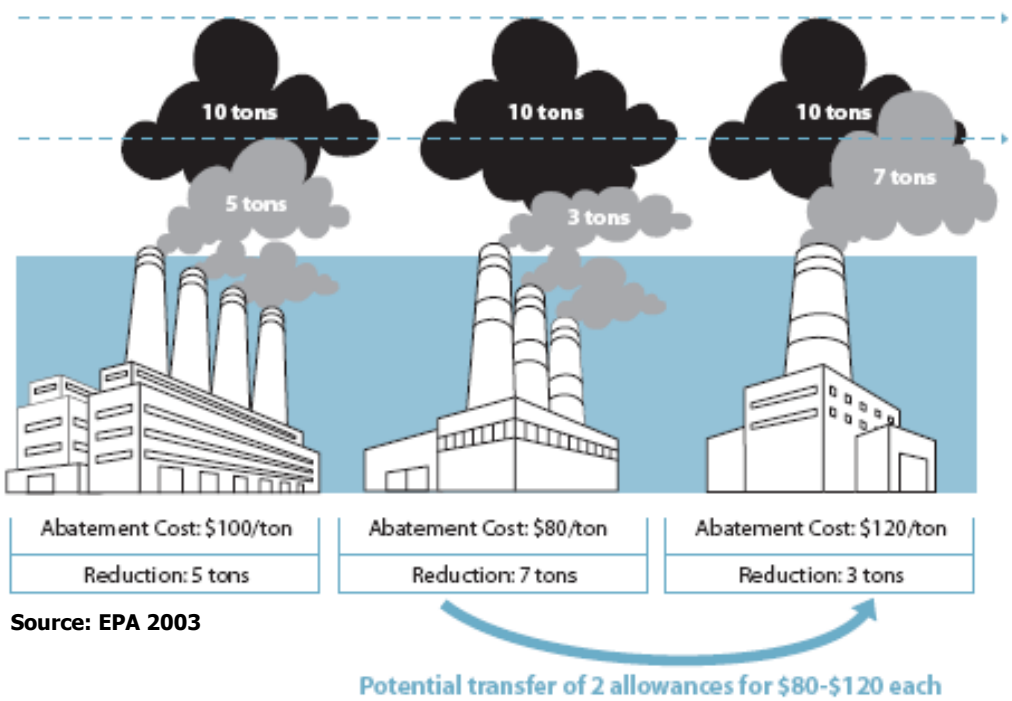
Cap-and-Trade. Design Principles

2. A cap is divided into "allowances"
   - An allowance represents authorization to emit a specific quantity (unit) of emissions – for example, 1 ton of CO_2.
3. Allowances are distributed across a group of sources either by:
   - Direct Allocation/Free Distribution, where the regulated source incurs no cost, or
   - Auction, where the process and proceeds are managed by an "Auction Manager."

Cap-and-Trade. Design Principles

4. During the compliance period, sources measure and report their emissions.
5. Under the cap, sources are able to design individual strategies to meet overall reduction requirements. For example, the source may:
   - Install pollution control devices,
   - Implement efficiency measures,
   - Redesign manufacturing, processing and/or product design, and/or
   - Sell/purchase allowances.

The Basics of Cap-and-Trade



Source: EPA 2003

Total Cost = **$500** **$560** **$360**

Exchange between $160 and $240

The Basics of Cap-and-Trade

- Banking Allowances. Unused allowances can be carried over (or banked) from one compliance period for use in later periods.
- Level of banking allowed can vary depending on the program:
  - Unlimited Banking
  - No Banking
  - Restrictive Banking

When is Cap-and-Trade Appropriate?

- Global emissions with no clear local or regional impact. For example:
  - Greenhouse Gases (GHG) uniformly mix in the atmosphere.
  - Greenhouse Gases have long legacies.
  - One unit of GHG released in China

    ↓ *substantially equivalent*

    One unit of GHG released in New York

When is Cap-and-Trade Appropriate?

- A diverse range of costs and options exist to reduce emissions.
- The range of options may result from:
  - Facility Age
  - Geographic Location
  - Fuel Use
  - Availability of Technology

When is Cap-and-Trade Appropriate?

- Large number of sources contribute to emissions, which creates an active market for allowances.
- Transaction costs can be kept low.
- Verifiable methods exist to monitor, measure, and verify emission releases/leaks.
- Clear regulatory oversight & authority exists.

Some of the Quid Pro Quo of Cap and Trade

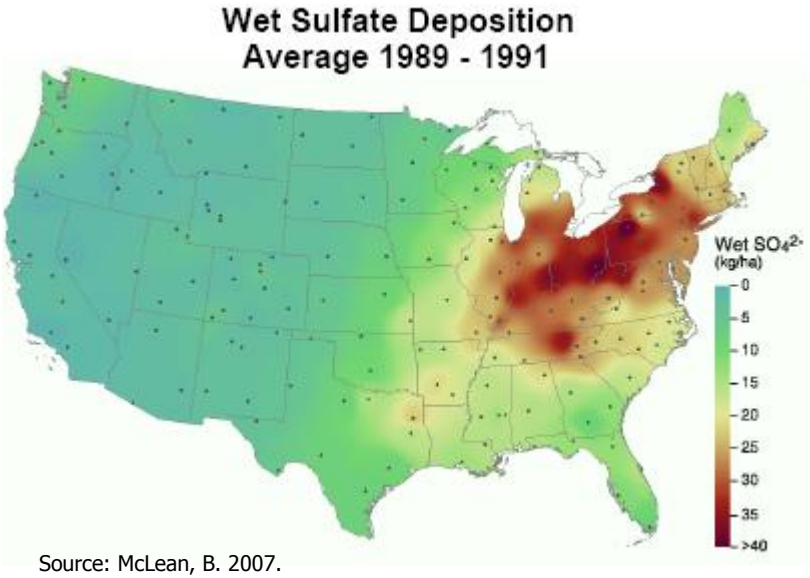
- Strict emission caps
- Allow markets to work (unfettered)
- No exemptions from caps
- Rigorous rules and penalties for failure to comply with the rules

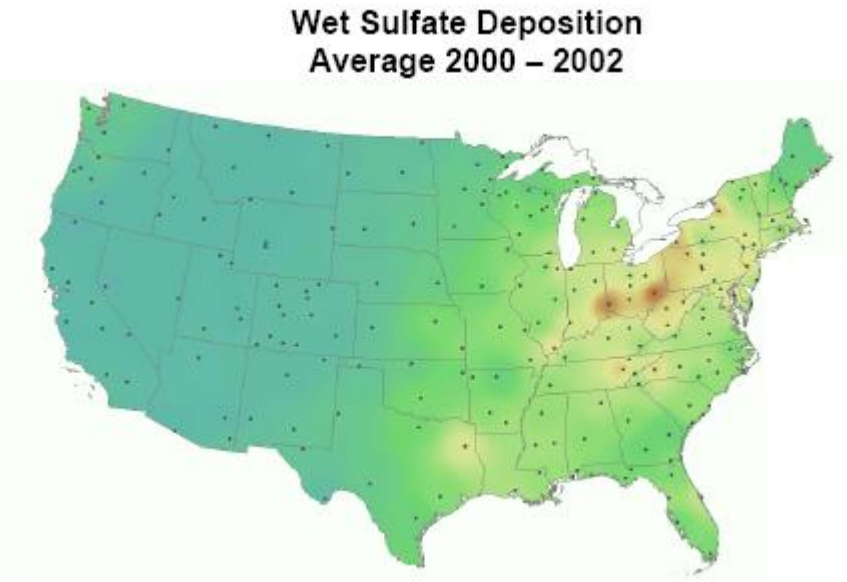
SO_2 Trading. Program Design

PROGRAM OBJECTIVE	▪ Reduce annual SO2 emissions to 50% below 1980 levels, or 8.95 million tons, by 2010.
POINT OF REGULATION	▪ 110 highest emitting coal-fired power plants with a capacity of > 100 MW
ALLOWANCE ALLOCATION	▪ 2.8% of allowances auctioned annually; remaining allowances distributed to covered entities. ▪ Phase I. Allocated annually at an emissions rate of 2.5 lbs of SO2/mmBTU, multiplied by the unit's baseline mmBtu. > Baseline mmBtu calculated as average fossil fuel consumed, 1985-1987. ▪ Phase II. Allocated annually at an emissions rate of 1.5 lbs of SO2/mmBTU, multiplied by the unit's baseline mmBtu.
BANKING	▪ Buyers and sellers may "bank" any unused allowances for future use. ▪ Between 1995 and 2000, 30% of purchased allowances were banked. ▪ During Phase II, 3.7 million banked allowances to cover SO2 emissions.
AUCTION REVENUES	▪ Auction proceeds returned to private allowance holders that contributed allowances to auctions.
EMISSIONS MONITORING	▪ Each unit must continuously measure and record its emissions of SO2. ▪ Most sources use continuous emission monitoring (CEM) system. ▪ Units report hourly emissions data to EPA on a quarterly basis and is recorded in the Emissions Tracking System.

SO_2 Trading. Program Results

- Greatest SO_2 emission reductions achieved in the highest SO_2-emitting states.
  - Acid deposition decreased by 30 percent in the eastern U.S.





Source: McLean, B. 2007.

SO2 – Quid Pro Quo

- Penalty for failure to comply set at multiple of expected cost per ton
- Requirement for Continuous Emission Monitoring (CEMs)
- Criminal Penalties for false emission reporting
- Transparent access to emissions reporting and allowance transactions

40 CFR Part 75 – Gold Standard for CCS?

- Continuous operation; ability to sample, analyze, and record data at least every 15 minutes.
- Conservative procedures for missing data
- EPA certification CEM systems before use
- Periodic performance evaluations of the equipment, including daily calibration error tests, daily interference tests for flow monitors, and semi-annual (or annual) RATA and bias tests
- Written quality assurance/quality control plan for each system including calibration, preventive maintenance, audits, and record-keeping and reporting
- Quarterly reporting of all data

Source: EPA CEMs Factsheet http://www.epa.gov/airmarkets/emissions/continuous-factsheet.html

When are Offsets Appropriate?

- Certain “early action” conditions
- Potential for significant reductions in sources not eligible for cap

EDF Criteria for GHG Offsets

1. Only direct emission reductions eligible
2. Reductions must be additional
3. Reliable and accurate quantification
4. Permanence (or limitations on permanence) must be clearly explained and justified
5. Project's start date and timeframe must be clearly defined
6. Clear ownership must be demonstrated
7. Emission reductions must be serialized and tracked (to prevent double counting)
8. Independently verified and verifiable
9. Net positive environmental impacts

Source: EDF http://innovation.edf.org/page.cfm?tagID=24880

Questions Before Moving On?

GHG Cap-and-Trade. Design Issues

- **Notable Decision Nodes**
  1. Point of Regulation – Upstream v. Downstream
  2. Identifying Target Emissions
  3. Establishing the Cap
  4. Managing Price Volatility
  5. Allocating Allowances
  6. Regulating the Carbon Market
- **<u>Goal.</u> Achieving Emissions Reduction**

Congressional Activity

GHG Emission Reduction Targets

July 2007
Bingaman-Specter [S. 1766]
4 percent decrease by 2050

May 2008
Manager's Amendment [S. 3036]
16 percent decrease by 2025
47 percent decrease by 2050

November 2009
Kerry-Boxer [S. 1733]
20 percent decrease by 2020
83 percent decrease by 2050

October 2007
Lieberman-Warner [S. 2191]
17 percent decrease by 2025
40 percent decrease by 2050

May 2009
Waxman-Markey [H.R. 2454]
17 percent decrease by 2020
83 percent decrease by 2050

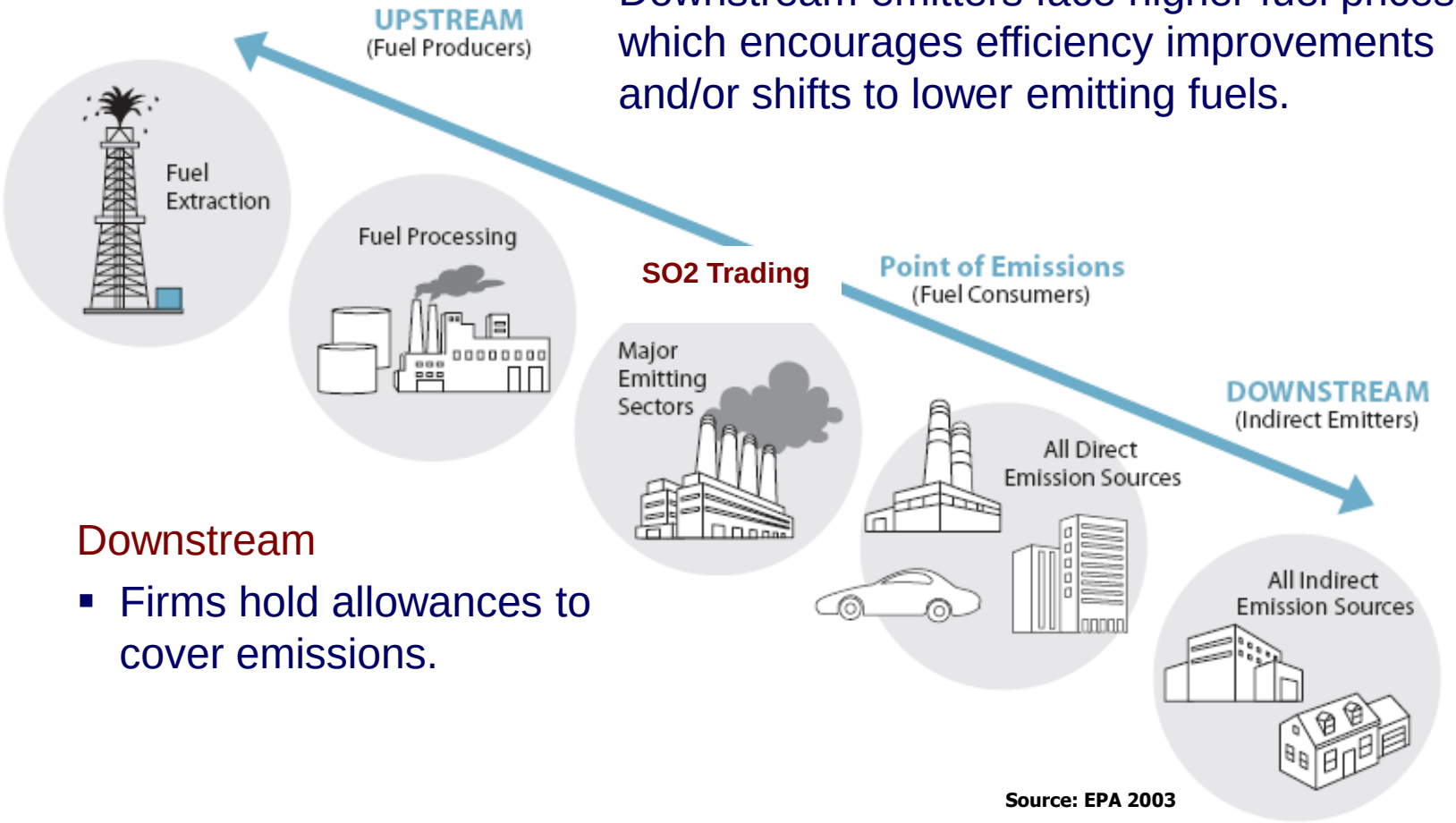
IPCC Fourth Assessment (2007)

50 to 85 percent reduction by 2050 (relative to 2000 levels)

1. Point of Regulation

Upstream

- Fuel suppliers hold allowances for the carbon content of fuel they sell to downstream emitters.
- Downstream emitters face higher fuel prices which encourages efficiency improvements and/or shifts to lower emitting fuels.



Downstream

- Firms hold allowances to cover emissions.

Source: EPA 2003

1. Point of Regulation

Upstream

- ✓ Feasible to address most CO_2 emission sources – minimize leakage
- ✓ May involve fewer than 2,000 regulated facilities – equivalent to Acid Rain Program numbers.
- ✓ Lower administrative costs.
- × Little experience with upstream cap-and-trade programs

- May not provide sufficient incentives to full range of emission sources to find new reduction or post-combustion control technologies.

Downstream

- ✓ Political and administrative advantages of familiarity.
- ✓ Acid Rain Program may be easily adapted for GHG.
- × Cannot be applied on an economywide basis. Hundreds of millions of downstream emitters, resulting in leakage.
- × Prohibitive administrative costs
- × Delayed environmental benefits

- Limit to a subset of emission sources (e.g., electricity generators and large stationary sources), accounting for 50% of CO_2 emissions.

1. Point of Regulation.
H.R. 2454 [Waxman-Markey]

- **§ 700(13). Covered Entity**

UPSTREAM	✓ Natural gas liquid-, petroleum- and coal-based liquid fuel producers/importers that annually produce 25,000 tonnes or more ✓ Producers and importers of fluorinated gases except HFCs
MIDSTREAM	✓ Natural gas Local Distribution Companies (LDCs) that deliver more than 460,000,000 cubic feet of gas annually to non-covered entities.
DOWNSTREAM	✓ Electric power generators ✓ Industrial sources (downstream) that annually emit 25,000 tonnes or more
OTHER	✓ Any geologic sequestration site

- CBO estimates 72 percent of US emissions covered by 2012 and 86 percent by 2020

2. Identifying Target Emissions.

H.R. 2454 [Waxman-Markey]

- **§ 711. Designation of Greenhouse Gases**
  - ✓ Carbon Dioxide
  - ✓ Methane
  - ✓ Nitrous Oxide
  - ✓ Sulfur Hexafluoride
  - ✓ Hydrofluorocarbons from a chemical manufacturing process at an industrial stationary source
  - ✓ Any perfluorocarbon
  - ✓ Nitrogen trifluoride
- **Any other anthropogenic gas designated as a GHG by the EPA Administrator**

3. Establishing the Cap

- Influencing factors – science, economics, politics.
- **Economic Perspective**. Most economically efficient level for the emission cap is where marginal abatement cost is equal to the marginal benefit from reduced emissions.
- **Environmental & Public Health Perspective**. Set at level that addresses environmental and health problems of concern.

H.R. 2454 [Waxman-Markey] (s. 1733 Kerry-Boxer)

- **§ 702. Economy-Wide Reduction Goals**

Relative to 2005 US GHG Emission Levels

2012
3 percent reduction

2020
17 percent reduction
(20 percent reduction)

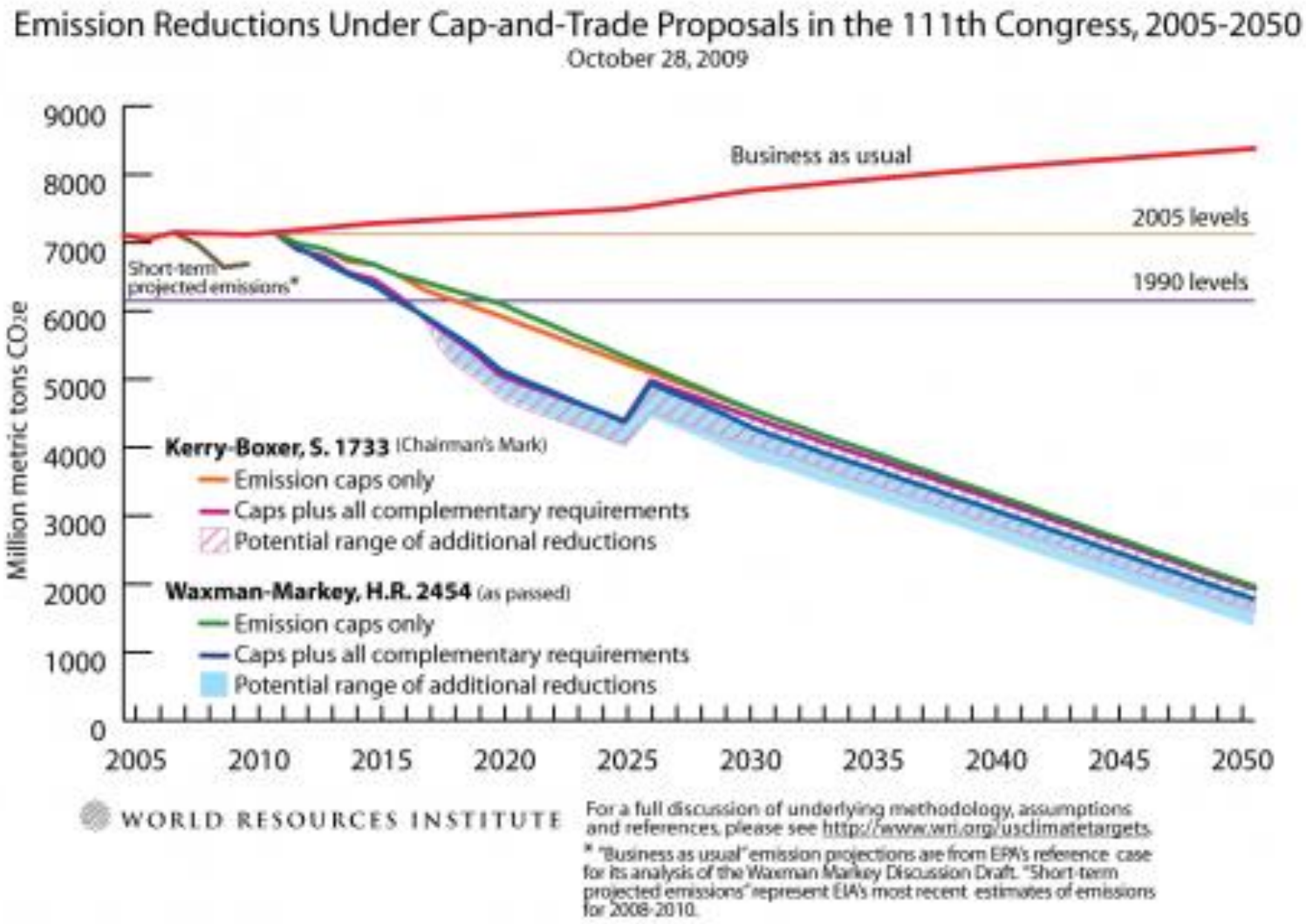
2030
42 percent reduction

2050
83 percent reduction

IPCC Fourth Assessment (2007)

50 to 85 percent reduction by 2050 (relative to 2000 levels)

Establishing the Cap.



4. Managing Price Volatility

- Declining Cap or “Circuit Breaker”
- Accelerator – Price Floor
- Price Cap or “Safety Valve”
- Borrowing Safety Valve
- Allowance Banking

4. Managing Price Volatility.
H.R. 2454 [Waxman-Markey]

§ 725. Allowance Banking and Borrowing

- Unlimited banking
- Unlimited next-year borrowing with no interest
- Ability to borrow up to 15 percent of compliance obligations from Year 2 through Year 5, beyond the current calendar year at an 8 percent annual interest rate

4. Managing Price Volatility.
H.R. 2454 [Waxman-Markey]

§ 726. Strategic Reserve

- **Safety Valve Mechanism**. If allowance prices rise too high in any given year, covered entities can purchase emission allowances from a "strategic reserve," established from future allowances:
  - 2012-2019: 1% of allowances
  - 2020-2029: 2% of allowances
  - 2030-2050: 3% of allowances

4. Managing Price Volatility.
H.R. 2454 [Waxman-Markey]

- Allowances available for purchase from the Reserve on an annual basis
  - Allowance price equal to twice the EPA price estimate for the average allowance in 2012, rising by 5% plus inflation in 2013 and 2014.
  - Thereafter, allowance price equal to 1.6 times the average allowance price for the previous three years.
  - Purchase proceeds will go toward the purchase of international offsets.

5. Allocating Allowances
Auction (Revenues)

- Studies suggest auction revenue can lower overall program costs by 20%-30%.
- Avoids windfall profits that might accrue if allowances were allocated free of charge.
- Avoids potentially contentious process of determining allowance allocation formulas.
- Creates an equal opportunity for new entrants into the market.
- But, can be costly for industry.

5. Allocating Allowances

- Under cap-and-trade programs, allowances have value – they're **Financial Assets**
- The allocation of allowances can be contentious
- In general, allowances are allocated either via **Direct Allocation/Free Distribution**, or via an **Auction**.

5. Allocating Allowances
Direct Allocation/Free Distribution

- Typically allowances are allocated based on historical emission information of regulated sources.
- Provides a means to offset some of the costs incurred under a cap-and-trade program.
- Allowances can be distributed to encourage certain types of technologies/innovation.
- Majority of allowances in existing cap-and-trade programs were distributed free, directly to regulated sources.

5. Allocating Allowances
Auction (Revenues)

1. Offset unintended program impacts.
   - Abatement costs tend to be passed onto consumers in the form of higher prices
   - Offset adverse economic impacts on vulnerable stakeholders (consumers, workers and shareholders).
2. Reduce corporate expenses (e.g., taxes).
3. Foster research and development of new technologies.

5. Allocating Allowances
Mixed System

Free Distribution

- ✓ For entities burdened by the policy (e.g., primary fuel suppliers, electric power producers, energy-intensive manufacturers, trade-sensitive sectors).
- ✓ Free allowances decline over time until it reaches zero.
- ✓ Allows time for the private sector to adjust to the new system.
- ✓ Addresses distributional concerns.
- ✓ Compensates private firms for associated equity losses

Auctions

- ✓ Generate revenue that can be used for public purposes:
  - Low-income consumers
  - R&D
  - Reduce Federal budget deficit
  - Reduce impact of distortionary taxes

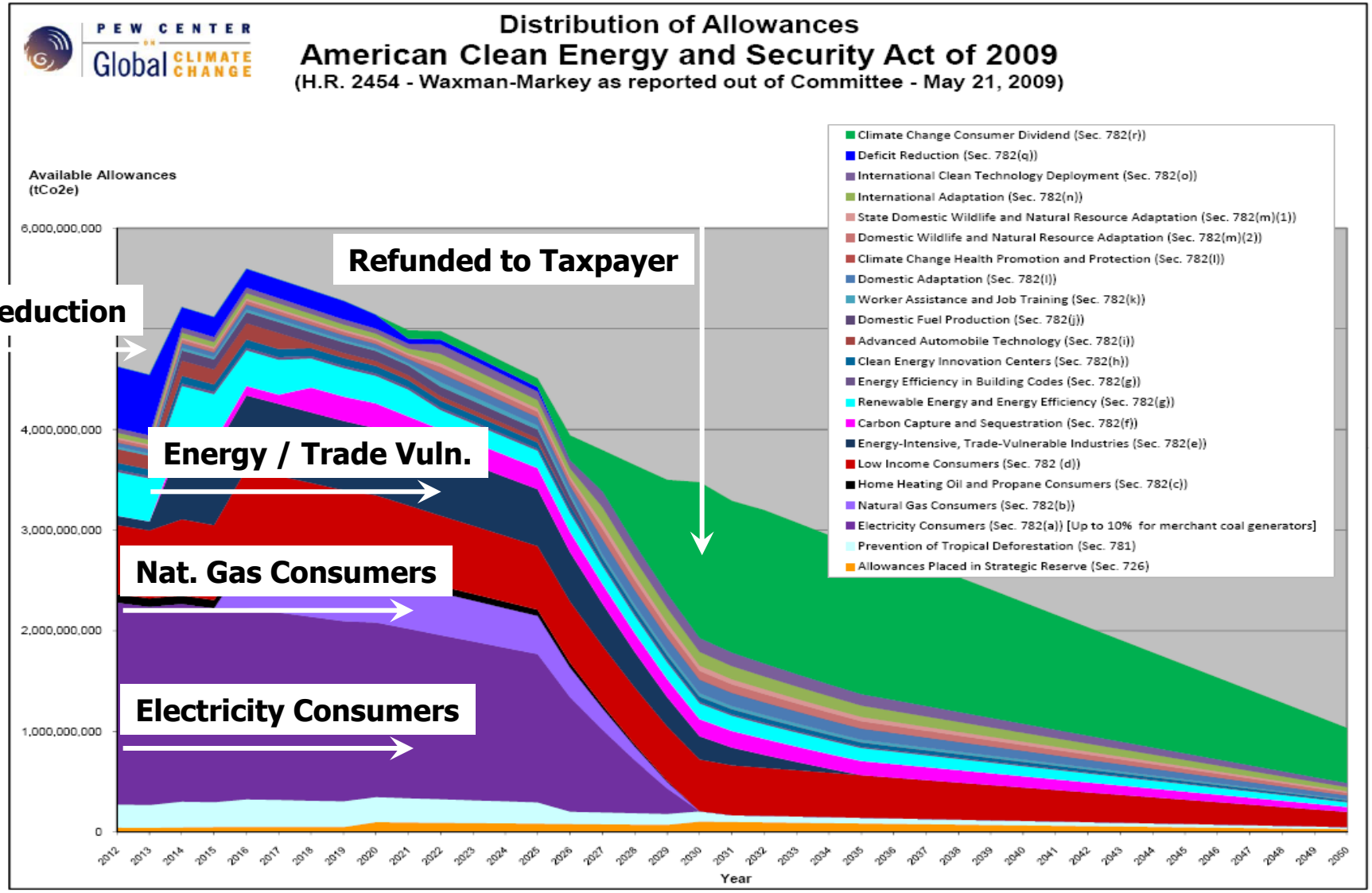
[Waxman-Markey]
80 % Free Distribution
20 % Auction

By 2031 …
30 % Free Distribution
70 % Auction

With that, a few words about…

Allocating Allowances.

H.R. 2454 [Waxman-Markey]



Allocations to CCS

Year(s)	Waxman-Markey / %	Kerry-Boxer / %
2014-2017	1.75%	1.75%
2018-2019	4.75%	4.75%
2020-2050	5%	5%

Allocations to Early Action

Year(s)	Waxman-Markey / %	Kerry-Boxer / %
2012-2013	1%	2%
Split	0.75%< Jan 09	0.25%>Jan 09

Questions Before Moving On?

Implications for RCSP CCS Projects

- John Litynski – NETL
- John Kadyszewski – American Carbon Registry
- Keith Driver – Blue Source
- George Peridas – NRDC

Questions for the Panel

1. Should reductions from R&D projects count as reductions that could be traded in voluntary or potential future regulatory markets?
2. If so, who owns them?
3. Since R&D projects have to comply with permit requirements stipulating M&V requirements, what else should they to do to prove the volume and validity of reductions? Does there need to be different treatment for EOR vs saline based storage?